4: Joseph et al D, E-5 (1942-1943) 1949
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but the summer storms come suddenly, the clouds pouring out water and then disappearing as quickly as they came. Rainfall varies greatly on different parts of the Reservation. In the southeastern districts where the mountains are highest, annual precipitation reaches an average of 18 inches in the mountains and about 13 inches in the valleys. Most of the permanent springs and the few small streams that flow for nine months in wet years are located in the foothills of this area. From the center of the Reservation westward, rainfall decreases progressively, averaging only 5 inches in Gu Vo District. Averages give no realistic picture, however, for years of good rainfall are often followed by years in which the washes do not flow at all. The year 1943, when the field work for this study was done, was one of extreme drought, perhaps the worst in history.

Temperature also fluctuates greatly. Winters are mild, with many sunny days, but sometimes the winds are raw and cold, and at night the thermometer may fall to 15° Fahrenheit. Sometimes snow falls on the higher mountains and may remain several days. The summer, from May through September, is extremely hot, with daytime temperatures usually exceeding 100° and often soaring to 120°. Daily range of temperature is wide; the average daily maximum and minimum are 82.5° and 51.1°—an average daily change of 31.4°.

Soils on the Reservation are generally of very good quality; lack of water is the prime factor limiting production. Hence the more arid western districts have a much lower proportion of farm lands and lower range carrying capacity than the central and eastern districts.

Like rainfall, vegetation varies with elevation. On the valley floors are miles and miles of cholla cactus and almost useless creosote bush,[5] and along the washes the sturdy and useful mesquite thrives. In the eastern districts mesquite is the characteristic growth; in the western areas the creosote bush, and in some alkaline regions the saltbush, are the most common plants. Even the mesquite areas are not so useful for range lands as they once were. Until about 1900, these areas were largely covered with perennial bunch grasses which provided good forage and helped to retain the topsoil. With increasing numbers of livestock, these grasses disappeared and the common grasses now are annuals which for forage must be supplemented by mesquite, cholla, saltbush, bur sage, and paloverde. Loss of the perennial grasses has also permitted considerable soil erosion, although there is little gullying because the valleys are flat.

Where the valleys rise to the foothills, and continuing over most of the low ranges, paloverde, ironwood, and giant saguaro cactus are the main stands.

5. The creosote bush does furnish lac, a gum with which the Papago mend pottery, and it has some medicinal uses. But animals will eat it only in an extremity. [323] [314]

17:Castetter & Underhill N.E-5 (1931-1934) 1935
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basket bowl constituted the drum, and a small basket might serve as a drinking cup. All these because of the hard usage received were usually made of willow throughout, but for the water-tight vessels willow was essential as it swelled and filled the interstices.

The water bottles (no longer used) were tall, slender bottle shapes with an incurving neck. They were smeared outside with a gum-like secretion from the white brittlebush *(Encelia farinosa)*.

The basket granaries seen were about three feet high and sloping up gradually from a two-foot base. The warp element was beargrass *(Nolina erumpens)* or wheat straw when the latter was available; the weft, mesquite bark *(Prosopis velutina)*. ((For details see Kissell, 16).

The tools for coiled basketry are awls with points of varying length, at present made of steel but formerly of mesquite wood, generally with a handle of creosote bush wood *(Covillea glutinosa)*.

COTTON SPINNING AND WEAVING

Weaving was a rare art practiced by a few old men. One who wanted a cotton blanket or skirt would trade for the cotton, either from the few who raised it or from the Pimas. He might be able to have the spinning done at home but generally he brought the load of raw cotton to the weaver, with the gift of a large basket, beads, or dried produce. This was the price for the weaving.

The weaver called in all his neighbors for a spinning bee, giving them their meals as pay. Both men and women could spin but it was a favorite occupation of old men. They first ginned the cotton by putting it in a basket bowl and working the seeds out with a stick. To separate the fibers the worker twanged his bow string over them, causing the topmost fibers to twist around the string. This method is described by Spier (23) for the Maricopa who perhaps learned it from the Pima. The cotton was spun on a spindle of arrow weed *(Pluchea sericea)* eighteen inches high, with

17:Castetter & Underhill N,E-5 (1931-1934) 1935
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game. The stone tip was set in a foreshaft of hardwood, usually creosote bush *(Covillea glutinosa)*, although wood of the desert broom *(Baccharis sarothroides)*, or the soapberry or Chinaberry tree *(Sapindus drummondii)*, might also be used. The twigs were cut green, peeled and straightened by hand or with a stone arrow straightener, then laid away to dry. On the day of the arrow making they were split at one end to receive the tip and dipped in boiling "gum," which must always be the secretion found on the white brittlebush *(Encelia farinosa)*, since mesquite "gum" melts in the sun and creosote bush "gum" is too sticky and adheres when the arrow goes through the grass. The arrow point was inserted in the slit at the end of the twig and when the "gum" had cooled, tied with a wet sinew. For shaft material a piece of the flower stalk of the Spanish Bayonet *(Yucca elata)*, which is very light when dried, was used. However they also used for this purpose a reed (probably *Phragmites communis)*, which they picked along the streams of the Pima country when they went there to work or trade. A hole two inches deep for the insertion of the foreshaft was bored in the pithy center of the shaft with a stick of creosote bush *(Covillea glutinosa)* sharpened to a point and roughened for friction with a stone. The end of the foreshaft was pointed with a quartz scraper, the foreshaft pounded into the hole and deer sinew wrapped around the joint for the whole of its length.

The preferred feathers for war arrows were those of the eagle *(Aquila chrysaetos)* and of three genera of hawks. The buzzard *(Cathartes aura septentrionalis)*, turkey *(Meleagris gallopavo merriami)* and crow *(Corvus brachyrhynchos hesperis)* were ineligible "as the buzzard is stupid and does not kill and the other two birds are timid." Chicken hawks *(Accipiter* sp.) were kept in cages and their tail feathers plucked.

The quill was reduced by cutting off the tip to about five inches in length, after which it was split and the inside cleaned with the thumbnail. It was then scraped bare for